



CIRCASA

(Coordination of International Research Cooperation on Soil Carbon Sequestration in Agriculture)

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Climate change is a priority topic that forces governments to find new ways to combat and to adapt to the increasing temperatures. We all know that the main cause of climate change is the high amount of greenhouse gases released into the atmosphere, and atmospheric carbon is in the spotlight.



But what if the solution is under our feet?

Soils are an enormous natural reservoir of carbon; they contain nearly twice as much carbon as the atmosphere (Quèrè *et al.*, 2015). Moreover, agricultural soils represent an important surface and land area, and most importantly, they naturally carry a large potential for carbon sequestration in the form of soil organic carbon (SOC), especially in degraded soils (Paustian *et al.*, 2016) that once contained significant amounts of carbon. Through stabilisation mechanisms in soil organic matter (SOM), the SOC contained can remain stored in the soil for thousands of years. In this sense, enabling and enhancing SOC sequestration appears to be a real nature-based and no-regret solution to mitigate climate change.

Both preserving and enhancing SOC has further benefits for the environment, people and livelihoods. It contributes to improved soil quality, agricultural productivity, biodiversity and water protection and thus increased resilience against climate change as shown by the IPCC Special Report on Climate Change and Land. Furthermore, it is by far the cheapest option for climate change mitigation.

How to get there

Unfortunately, modern agriculture and the intense use of harmful chemicals are turning our soils into dirt. This is why implementing specific soil management practices that support healthy soils and preserve soil organic matter is so important. Cover crop planting, refrain from deep tilling, and

perennial planting are just some examples of this 'negative-emission technology'. Without carbon sequestration, it would be practically impossible to stay within +2°C for 2030 as targeted by the Paris Agreements (Wollenberg *et al.*, 2016, GCB). Carbon sequestration is also crucial for several of the planned actions within the [European Green Deal](#), especially the "Farm to Fork Strategy". Other EU missions like the Soil and Health Food Mission Board proposed the "[Caring for soil is caring for life](#)" mission to ensure that 75 per cent of soils are healthy by 2030. This is a big step to advance towards the implementation of the [UNFCCC Sustainable Development Goals \(SDGs\)](#). Soils carbon sequestration can help to take steps towards achieving at least five of the 15 SDGs such as zero hunger, healthy lives, clean water, climate action and protecting life on Earth.

The [CIRCASA project](#) (Coordination of International Research Cooperation on Soil Carbon Sequestration in Agriculture) aims to develop international synergies concerning research and knowledge exchange in the field of carbon sequestration in agricultural soils at the European Union and global levels. This H2020 project was launched in 2017 with a duration of three years and has 22 partners from 17 countries all around the world who bring a uniquely dense network of scientific expertise. The project also benefits from the close participation and collaboration with the research secretariats of the "[4 per 1000](#)" initiative, [Global Research Alliance \(GRA\)](#), the [Joint Programming Initiative on Sustainable Agriculture](#), Food Security and Climate Change (FACCE-JPI), and the [FAO Global Soil Partnership](#).

Needs for research and innovation alignment

Scaling up climate-smart soil management requires a range of barriers to be addressed, especially the availability of knowledge. It is crucial to empower farmers and other stakeholders through effective knowledge creation and exchange—evidenced by our interactions with stakeholders. They also required information on financing options, benefits, policy measures and mechanisms and monitoring, as well as reporting and verification (MRV) methods. The accessibility and applicability of existing knowledge is a key area of concern, as shown by the CIRCASA project studies on stakeholder's needs.

The CIRCASA project has developed a strategic research agenda (SRA) (CIRCASA, 2020a) grounded on scientific evidence (CIRCASA, 2019) to take these insights forward. It identifies research and innovation needs and supports the demands expressed by stakeholders (CIRCASA, 2020b) in ten world regions.

The ultimate goal of the SRA is to inform widely relevant priority goals and measures that align with broader European and international research in the area of SOC and to allow partners to promote the generation of new relevant knowledge jointly.

The SRA underlines the increasing need to develop an international research consortium (IRC) on SOC in agriculture to coordinate international collaborative efforts, facilitate and align research and innovation activities both in the EU and in other world regions.



An IRC would enable a structured approach and improved international coordination to create breakthroughs, avoid duplication of activities and develop innovation on a large scale. To achieve this, the CIRCASA project's SRA is structured in four pillars resulting from the agreed priorities for the IRC:

Pillar 1

Frontiers research: unlocking the potential of soil carbon

Research collaboration and cross disciplines have the potential to deliver a renewed understanding of soil functions, dynamics and biodiversity, which together govern soil carbon, soil health, and ecosystem services.

Pillar 2

Soil carbon monitoring, reporting and verification (MRV) system

Develop and scale up rapid cost-effective assessment methods for SOC monitoring, reporting and verification. This may involve remote and proximal sensing technologies, but equally important in this context are farm-level monitoring tools and mechanisms, and the potential of crowd-sourcing farm-level data (see Figure 1).

Pillar 3

Agro-ecological and technological innovations

Fostering technological innovation through public-private cooperation, for example in plant breeding, biochar and organic amendments or, precision agriculture and machinery.

Pillar 4

Enabling environment and knowledge co-creation

Scaling up soil carbon sequestration activities is a challenge that would need to address a variety of socio-economic barriers and incentives (cultural, social, economic and political especially for farmers). Understanding financial, policy and capacity building mechanisms that are effective and equitable is a key open research gap from various levels, bottom-up to national to international. An international research agenda can stimulate the setting up of these infrastructures, provide an impulse for different ways of working through co-creation methods or more transdisciplinary approaches that involve different stakeholders.

Why is an IRC needed?

Imagine if farmers and their direct advisers would know exactly how much carbon is stored in their soils and as the main actors of climate change, they could be rewarded for their efforts and actions to secure and enhance this carbon stock. Using an integrated MRV system, satellites, soil surveys and long-term field experiments, CO₂ flux measurements, agricultural innovation could help farmers to keep their soils healthy and the data gathered could be used at different scales for different purposes.

International cooperation can stimulate the creation of advisory infrastructures; provide an impulse for different ways of working through the co-creation method or more transdisciplinary approaches. This will address identified barriers such as costs and benefits analysis, from farm level to societal scale.

This SRA is the support of CIRCASA's IRC, necessary to implement a plan for the identified priorities through institutional and investment arrangements as shown on [CIRCASA video](#).

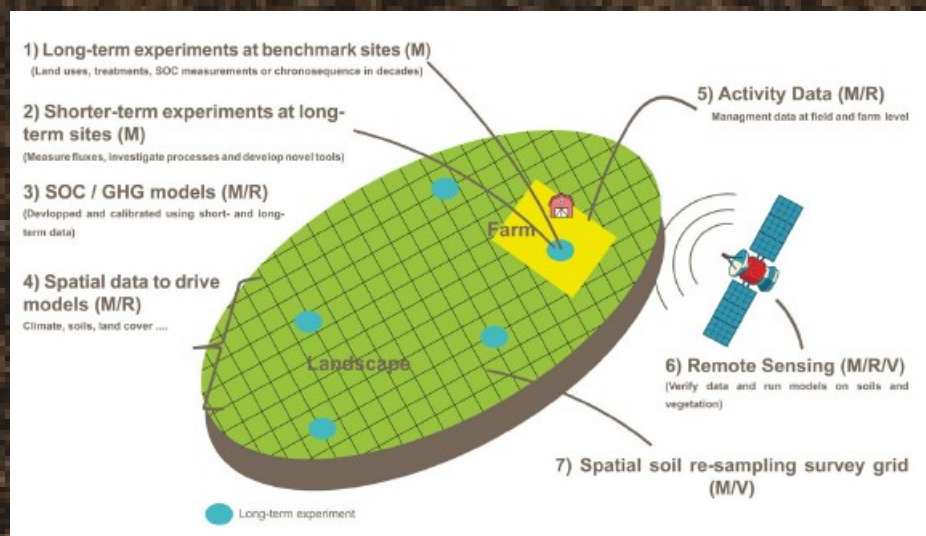
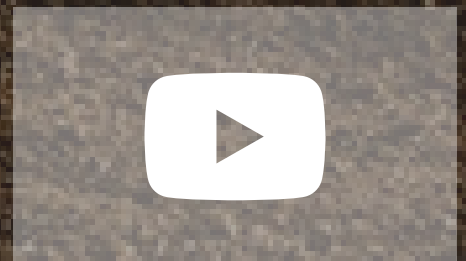


Figure 1: The innovative vision developed by CIRCASA for a global framework for MRV of SOC change. (Image modified from original <https://www.circasa-project.eu/Document-library/Scientific-Articles/How-to-measure-report-and-verify-soil-carbon-change> paper, Smith, Soussana et al. 2019, *Global Biology*).

What would an international research consortium on agricultural soil carbon sequestration look like?

To create an international and interdisciplinary community implies mobilising different sectors and stakeholders, including scientists, public agencies, and the private sector, farmers associations, industries, or even space agencies. The four pillars of the SRA are pursued in interaction with the different categories of IRC members and manoeuvred by consortium governance; each topic may require specific consortia and institutional arrangements.

VISION OF THE CIRCASA IRC

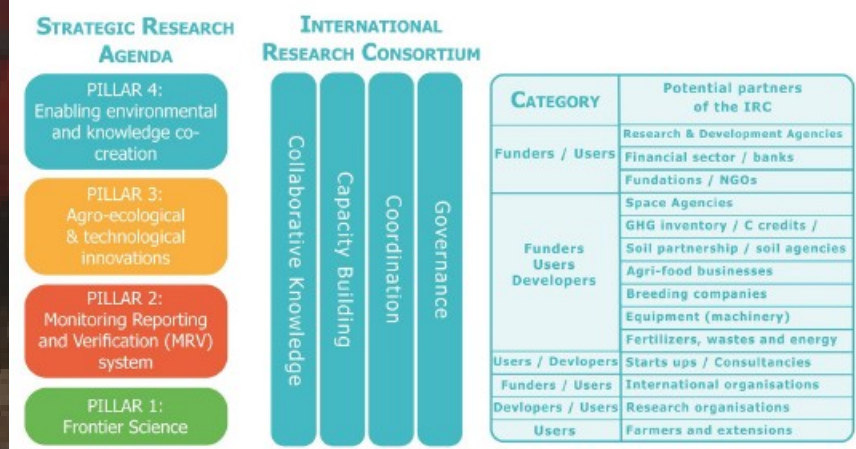


Figure 2: Vision of an international research consortium on agricultural soil carbon, showing the four pillars of the strategic research agenda, the activities of the IRC, the potential partners and their roles as funders, users and developers of IRC activities.

For the needs of this SRA to be met, funders have to be able to see why they should invest in research and innovation activities within the IRC. End-users need to see how specific activities will create desirable outcomes and researchers need to find funding and an attractive environment. International cooperation for research and innovation can generate a large range of outputs for national and local stakeholders, including access to knowledge and innovation, demonstration of new technologies and new assessment methods, training, and capacity building.

Are you interested in participating in this IRC?

The IRC will programme the development of these research priorities in close collaboration with the European Commission, with research organisations, public agencies, and the private sector. To this end, CIRCASA has started to take stock of the interest of organisations considering the categories of potential partners of the IRC. For each category, a task force led by CIRCASA partners has been organised to broker interest, develop use cases, customer stories and seek expressions of interest for this strategic research agenda. Task force meetings are organised to discuss

the level of commitment via in-kind or cash contributions required to become a member of the Consortium.

After three years, the H2020 CIRCASA project will come to an end, and a final high-level conference will take place in the first weeks of February 2021 in Brussels. This will be an opportunity to gather stakeholder's expressions of interest on the pillars of the IRC and prepare its final launch later in 2021. This final meeting has limited paces. Please contact the CIRCASA team if you or your organisation is interested in registering and joining the final meeting.

After the project, both the international research consortium and our open collaborative platform (OCP) will be CIRCASA's legacy. This OCP tool structures and integrates existing knowledge on soil organic carbon sequestration in agriculture and it hosts the knowledge information system (KIS). The (pilot) KIS serves as a structured knowledge repository as well as an international exchange forum for researchers and all stakeholders to complement and collaboratively validate the available knowledge usefully. If you would like to contribute to the KIS with your data, please contact us! We are happy to hear from you!

[Click here for article references](#)

PROJECT NAME

CIRCASA

PROJECT SUMMARY

The overall objective of CIRCASA is to strengthen synergies among researchers and promote the transfer of knowledge on carbon sequestration in agricultural soils. The final goal of the project is to set up an international research consortium (IRC) that will coordinate international collaborative efforts to facilitate and align R&I activities to create breakthroughs, avoid duplication of activities and develop innovation on a large scale.

PROJECT LEAD PROFILE

CIRCASA is led by INRAE, the National French Research Institute for Agriculture, Food and the Environment. INRAE carries out research for better food and nutrition, preservation of the environment and competitive, sustainable agricultural practices with an emphasis on sustainable development. The project is coordinated by Jean-François Soussana, Vice-Chair for the International Affairs, senior scientist at INRAE, member of the Working Group II of IPCC since 1998, lead author for the 3rd, 4th and 5th Assessment Reports and the Special Report on Land and climate change.

PROJECT PARTNERS

Many countries and institutions leading international research cooperation on soil carbon sequestration in agriculture are partners of CIRCASA. Together, they bring a uniquely dense network of scientific expertise. CIRCASA has 22 partners from 17 countries, including the research secretariats of "4 per 1,000", GRA, and FACCE-JPI. Together with these initiatives and with CCAFS - CGIAR, CIRCASA has direct outreach to a total of 82 countries accounting for 85 per cent of the world's total research on soil sequestration in agriculture.

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